

Contacts

Research & Innovation Office Staff

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Did you know?

The University of Maine's
Advanced Structures & Composite
Center has the world's largest
thermoplastic 3 D printer and has
made the world's largest 3D printed
boat, the 3Dirigo.



Research Project Highlights

Welcome to the MaineDOT Research & Innovation Office's first newsletter! Well it's

the first one that's been done in a long time and is very much overdue. It's important that Department research & innovation accomplishments and highlights are shared, and that people are recognized for their contributions to improve what we do. Please take a few minutes to read through this and let us know what you think.

Some new projects getting underway:

Our partners at the University of Maine and Advanced Infrastructure Technologies have developed a new type of bridge system, the composite tub girder (CT Girder). The Department currently plans to construct two bridges in Hampden using this technology. The use of composite (fiberglass, carbon fiber, etc.) materials has the potential to improve the service life and maintenance costs of our bridges. This new study will supplement ongoing work to better define and understand the shear resistance of the girder webs.

When near water, one of the construction challenges we face is to identify and get permits to work around aquatic species, think fish, turtles, etc. Traditional methods to determine the presence of these species can be time consuming and expensive. Environmental DNA (eDNA) is a tool that can be used that includes collecting water samples and running DNA tests to determine if species are present near our construction projects. This new study will develop eDNA protocols for aquatic species of interest in Maine.

The Department is joining a few pooled fund studies. These types of studies leverage funding and expertise from many state DOT's to work on a topic(s) of common need and priority. New pooled fund studies are:

Performance Engineered Concrete Mixes

***Continuous Asphalt Mixture Compaction
Assessment Using Density Profiling System***

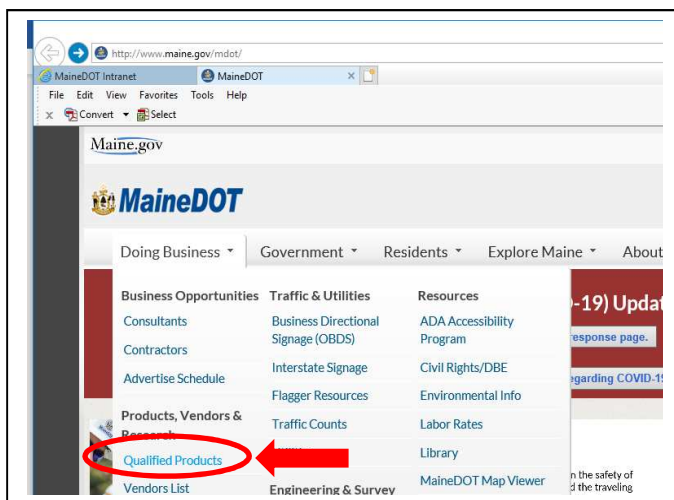
Evaluations of Low-Cost Safety Improvements

Aurora – Road Weather Information Systems

MASH – The Manual for Assessing Safety Hardware

Roadside safety hardware (guard rail, bridge rail, concrete barrier, etc.) undergoes extensive crash testing before being allowed along on the country's highways. The latest crash testing protocol adopted by AASHTO and the FHWA is called MASH.

Items like guard rail end treatments, crash cushions and attenuators and work zone traffic control devices, must have passed MASH crash testing criteria before being considered for our Qualified Products Listing. Other factors include maintainability in snow and ice conditions and actual in-service performance.



In this newsletter edition, we'll give a broad overview of the Department's New Product Evaluation Program and the Qualified Products Lists which can be found on the MaineDOT website.

Some 25 years ago the Department recognized the benefits of having a more centralized and formal product evaluation process. Before this it was like the wild west with product manufacturers working with people throughout the Department, no clearly established criteria for acceptance, a lack of consistency on product usage and generally no documentation on which products were acceptable.

Now there's a resource that both staff and contractors can use to determine which products are OK to use, the **Qualified Products Lists**. You might ask, couldn't this be done by listing everything in our standard specifications? Yes, but the Lists are ever changing, and nobody wants to continually update and provide addendums to specs., right George?!

What you might want to know about our Qualified Products Lists.

From concrete admixtures & asphalt release agents to erosion control items & safety delineation

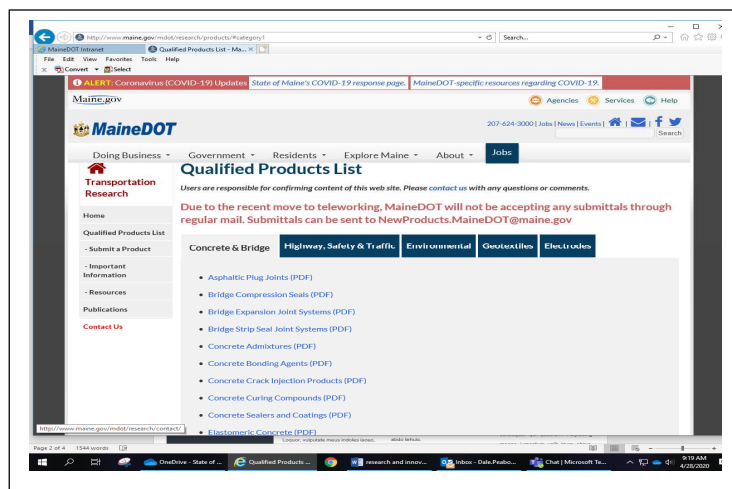
In any given year, we'll receive about 100 new product submittals. The managing of these is led by our Products Coordinator with a lot of assistance from our three product committees and others too.

“Our centralized program enables a One DOT approach to product qualifications”

Dawn Bickford, the Product Coordinator, now manages over 40 Qualified Products Lists and is a great resource for those that need information to submit products or to determine eligibility on DOT projects.

Our Department program is joined at the hip with AASHTO's National Transportation Product Evaluation Program (NTPEP) and the AASHTO Product Evaluation Listing (APEL). Both national programs assist DOT's with finding common ground on acceptable criteria for products and provide product testing at certified third-party laboratories. Our specifications and product acceptance criteria require NTPEP certification, if available and it makes sense for the Department.

More on NTPEP and APEL in future newsletters.





MaineDOT Drone Program takes Flight

Innovations & Solutions

As most of you are aware, over the past several years there has been a tremendous increase in the use of unmanned aircraft systems (UAS or drones) in our industry. Globally experts predict a 25% to 37% increase in drone use for aerial surveying, mapping and infrastructure inspection this year alone. Much of this is due to new, less restrictive FAA rules adopted in 2016.

The Department has established an Unmanned Aerial Systems or drone program and has completed over 40 missions over the last two years from Recycled Asphalt Pavement stockpile volume management to monitoring freshwater tidal mudflat re-vegetation, we're finding innovative ways to improve efficiencies. Thanks in large part to our Technical Users Group and folks from the Property Office, pilots Kyle Braga, Jason Everett and Matt Emery, the drone program is growing leaps and bounds. Nick Dutil is providing the data collection analysis and final product.

MaineDOT currently owns three drones: 2 – DJI Phantom 4's and a DJI Matrice RTK. The Phantom 4's have become our workhorse system while the Matrice has the ability to capture data using multiple sensors like zoom cameras and infrared cameras and has the added benefit of more accurate GPS positioning with the RTK. Plans are in place to purchase two more Phantom 4's (with RTK) and for adding at least three more pilots. We will be potentially expanding drone usage to support structures inspection and terrain mapping and modeling for highway construction.

For more information contact Nick Dutil or Dale Peabody.

EYE ON Innovation

Growing a Culture of Innovation in the Transportation Community

MaineDOT has a Statewide Transportation Innovation Council (STIC) that provides a forum to share ideas and empowers us to adopt new innovations. This is part of the FHWA supported national STIC network.

Other FHWA-led efforts are Every Day Counts and Accelerated Innovation Deployment. For more information visit: <https://www.fhwa.dot.gov/innovation/>

The AASHTO Innovation Initiative helps market transportation innovations through state-led teams. The goal being to promote broader acceptance of new technologies across the country. <http://aii.transportation.org/Pages/default.aspx>



INNOVATION SPOTLIGHT

Question: Why is there no Spotlight here? Answer: Because we want to hear from you.

Please submit your ideas for innovations being used in your work environment. Have you come up with a safer, quicker way to change snow plow blades or know someone that has? Are you adopting a new technology or process that is making your work life a bit easier? I know there are some real good examples out there. Let's build on the innovative culture that exists already here at MaineDOT and talk about the cool things happening. Submit to: dale.peabody@maine.gov

Do you know what this is and how it's benefiting MaineDOT? Check out the R&I Newsletter Issue #2 for the answer.





"Running the 3-D model without having to conduct actual crash testing has saved us time and money and provides added assurance that the existing steel bridge rail is safe"

**Jeff Folsom – MaineDOT
Assistant Bridge
Program Manager**



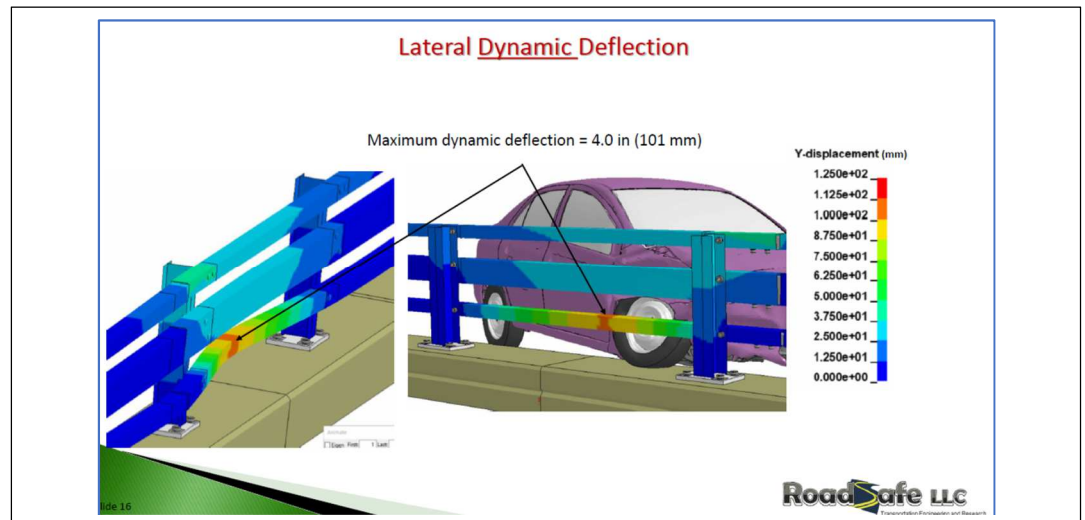
Research Making a Difference

Development of MASH Computer Simulated Steel Bridge Rail and Transition Details

MaineDOT often uses steel rail on its bridges. This type of rail not only protects the traveling public but also provides a more appealing look. Bridge rail, just like all other roadside safety hardware, must be crash tested to meet certain criteria (see page 2 insert). Over 20 years ago our steel bridge rail configuration was crash tested to the NCHRP 350 criteria. Fast forward to the present day and MASH criteria (different car and truck dimensions, vehicle speeds and collision angles). There are only a handful of crash testing facilities across the country and just one suite of tests can cost over \$400,000. The good news is there are now sophisticated 3-D modeling tools, and people smart enough to use them, so crash testing can be simulated. These tools are extremely accurate when compared to results from an actual crash test.

Using funds from the New England Transportation Consortium, we worked with the other New England state DOT's and Chuck Plaxico from Roadsafte LLC in Canton, Maine to run the simulation model for the steel bridge rail now in use throughout the region. The study was recently concluded, and the results show the 2 – Bar and 3-Bar rail systems meet MASH criteria. The 4-Bar rail system meets MASH criteria as well, but significant damage to the system is sustained. Design improvements to the 4 – Bar system details are recommended.

Armed with results from this study along with good performance of the steel bridge rail over the past 20 years our bridge engineers can now be confident in knowing the rail is safe for the travelling public.



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